SOME NEW ASPECTS OF COCONUT MANURING

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I have taken advantage of the present occasion to discuss some of the scientific and economic aspects of coconut manuring, as conditioned by recent developments

of coconut manuring under discussion :

(*a*) The fall in the price of copra following the Korean boom of 1951,
(*b*) The comparatively high cost of manures,
(*c*) The scarcity and high cost of labour,
(*d*) The progressive senility of palms,
(*e*) Replanting,
(*f*) Reconditioning of estates as a part of the proposed Rehabilitation Scheme,
(*g*) The establishment of the Milk Board.

Unlike the tea industry, or even the rubber industry, coconut cultivation is generally not organised on the basis of a plantation economy managed through Agency Houses in Colombo. The financial and credit resources of coconut estates are meagre. Few estates work on the basis of any planned estimates and a pre-arranged programme of work. The tempo of cultivation and manuring fluctuates with the rise and fall of the copra market.

The coconut palm further suffers from the handicap that the results of manuring in the form of increased crop is only realised at least one year after the application of manure, if not later. The psychological tendency is no doubt to manure during high prices when the estates bring in a reasonable return, but it often happens that by the time the increased crop is marketed, the price of copra has fallen to such a level that the profits from manuring may not be as high as anticipated. Yet more, the vagaries of weather and the incidence of droughts can effect coconut yields to a most disappointing degree.

Further, in the case of badly-neglected estates the results of a single application of manure may be particularly disappointing and unless an owner has liquid reserves of cash to invest on manuring, he may hesitate to give the very necessary second application.

It was estimated that before World War II, that is seventeen years ago, barely 25,000 acres of coconuts were manured annually with artificial fertilisers. Since 1948, with the improvement in the price of copra the acreages manured as calculated by us, have considerably increased as shown below :

Year	*Acreage Manured*
1948	98,000
1949	91,000
1950	118,000
1951	145,000
1952	115,000

It will be observed that the peak year for manuring was 1951, when copra prices reached Rs. 300 per candy.

Copra prices have since then dropped to nearly half of this peak figure, and we understand that fertiliser sales to coconut estates have dropped.

Even when the price of copra reached the heights of the Korean boom, the amount of manuring carried out on the extensive area of poor soils, particularly on the lateritic soils of the Western Province, was negligible. The problem here was that the yields of most of the estates was so poor that the margin of profit did not leave a sufficient balance to be invested on manuring, except where long term credit facilities or state aid was available.

That money invested on manuring such lands gives a handsome return even at present prices is conclusively proved by the following data, based on our manurial experiments :—

Profit from manuring poor soil (lateritic) based on data of manurial experiment at Ahangama when prices of copra and cost of manure vary. Average increases due to manuring during two years—1,052 lb. or 1.875 candies/acre.

TABLE II

Price of copra per candy Rs.	*Gross value of increase due to manuring* Rs.	*Profit per acre during two-year period—Cost of manuring once in two years*			
		Rs. 1.00 *Rs.* 60.00	*Rs.* 1.25 *Rs.* 75.00	*Rs.* 1.50 *Rs.* 90.90	*per palm per acre*
100	188	128	113	98	
125	234	174	159	144	
150	281	221	206	191	
175	328	268	253	238	
200	375	315	300	285	

These poor soils which form the major percentage of coconut lands of the Island must demand our immediate attention in any programme of rehabilitation. At the present cost of manuring of about Rs. 1.50 per palm, the profit for a two-year period (manuring being biennial) is Rs. 190/- per acre (or Rs. 95/- per annum).

Besides improving the capital value of such lands, and enhancing the stability of our main national agricultural asset, the money spent by Government in subsidising a programme of manuring, will be to some extent recovered by Income Tax and Export Duties on coconut exports.

Subsidy for Manuring of Coconuts

I would further elaborate the economics of a government subsidy manuring.

On poor soils, on an expenditure of Rs. 90.00 per acre once in two years, a crop increase of 1.8 candies can be expected. At the present rate of export duty of coconuts, i.e. Rs. 185/- per ton, or Rs. 46.25 per candy of copra, the recovery of export duty on the increased crop will be Rs. 83.25.

On this basis, if government subsidises coconut manuring to the extent of 100 per cent Government will recover the money so spent to the extent of 92 per cent as export duty excluding Income Tax.

It will therefore be seen that the soundest policy to recondition the coconut industry is the grant of a liberal subsidy. The subsidy will pay for itself.

The provision made in the Six Year Plan amounts to Rs. 9 million spread over a period of six years. With this amount, even with a subsidy of Rs. 25.00 per acre only 60,000 acres can be manured annually. A subsidy to be effective must be generous as in the case of the Rubber Rehabilitation subsidy.

No amount of propaganda can induce estate owners to manure unless economic factors are favourable. It is hoped that the subsidised manure scheme will provide the necessary economic climate.

The Scarcity and High Cost of Labour in Relation to Methods of Application of Manures

The traditional method of manuring is in circular trenches cut round the palms. This method has stood the test of time and has given good results.

In considering the recent results of work in other countries on the ' placement ' of fertilizers this method of application could be considered to be sound. Among various advantages that can be suggested for deep placement of fertilizers close to the palm the following can be claimed :—

(*a*) The highest concentration of roots being close to the palm, facilitating maximum utilization of nutrients ;

(*b*) Reduction of fixation of phosphates by the soil, the ratio of soil to fertilizer being less than when broadcast over the square ;

(*c*) Reduced leaching of nitrogen as the area of percolation of rainwater is less in the manure circle than in the entire area between four palms. Further, rainwater collects more in the centre of the square than round the base of the palm which forms a slightly elevated platform ;

(*d*) When manure is broadcast and harrowed, appreciable losses of surface applied fertilizer may occur through run off ;

(*e*) In recent root studies carried out by us, we have observed that within the square, the root system is at least 9 inches to a foot below the surface. Manures broadcast on the surface may for this reason not reach this root zone.

Surface manuring would attract the roots to the top and would favour the development of a surface root system which may tend to make the palms susceptible to drought.

Whatever the possible advantages of manuring in trenches may be, a new situation has arisen in view of recent developments of the labour market. Not only have wages risen, making the cost of application and closing manure circles very high (about 45 cents per palm), but there is also an acute shortage of labour in most coconut areas due to factors which need not be considered here.

A further point to consider is that in the low rainfall areas, manuring is restricted to a short wet season, during which an adequate programme of manuring cannot be carried out by a limited supply of hand labour.

These considerations have brought to notice the desirability of testing a more expeditious and economical system of manuring such as broadcasting followed by harrowing or ploughing in of the manure.

We have been conducting a manurial experiment on an estate at Bingiriya to compare broadcasting with surface manuring. The soil consists of a sandy loam and this estate had always been kept at a reasonable level of cultivation. The experiment is now in the sixth year, but the results available to-date are not conclusive.

In the third and the fifth year, none of the responses were significant. In the second and the fourth year both phosphate and potash have shown significant responses, but there is no differential response to the two methods of application, i.e. in these two years potash and phosphate whether broadcast or applied in circular trenches gave an almost equal response.

The other experiment to which reference should be made in this connection is the manurial experiment on cover crops at Bandirippuwa Estate which were closed down in 1949. The relevant comparison here is between plots with no cover manured with a complete mixture (N.P.K.) in circular trenches and plots with cover where the manure was broadcast on the cover, harrowed and turned in with mamoties in the first five years and subsequently broadcast and harrowed. The following data show that, while in the early stages, the plots with cover crops showed a lower yield, those picked up during subsequent years and there is little difference between the two methods of application after sometime.

TABLE II

Lb. copra per acre

	2nd Year 1938 1939	*3rd Year* 1939 1940	*4th Year* 1940 1941	*5th Year* 1941 1942	*6th Year* 1942 1943	*7th Year* 1943 1944	*8th Year* 1944 1945	*9th Year* 1945 1946	*10th Year* 1946 1947	*11th Year* 1947 1948
No cover—NPK Circular Trenches ..	1,406	1,185	1,369	1,406	1,974	1,674	2,038	1,470	1,634	2,451
Cover—NPK (Broadcast) ..	1,241	829	1,365	1,270	2,030	1,556	2,091	1,566	1,655	2,455
Significant Difference	126	97	109	207	206	217	304	141	195	275

It should however be mentioned that the presence of a thick cover of *Centrosema* would make a material difference. The early setback on the cover plots may have been due to the severe drought of 1938-1939.

Another significant observation was that the active root system was mostly on the surface in the cover plots. Whether this was due to the surface application of manures or due to the dead mulch of covers on the surface we could not determine. The soil was a lateritic gravel.

Until we have many more field experiments on different soil conditions it is regretted that we are not in the position to give more definite advice.

In this connection another point to determine is the applicability of the recent flood of mechanical implements such as rotary disc ploughs in the application of manure.

Manurial Problems of Replanting

In a paper entitled ' Some Problems of Coconut Manuring ' presented by me to the Coconut Conference held in Colombo in 1947, I made the following observations :—

> ' Replanting will have its own soil and manurial problems to be faced. In most areas, particularly in lateritic slopes of the wet zone of the Western Province the soils are badly eroded and of poor fertility. It will be hopeless to expect second plantations to come into early bearing without systematic and annual manuring and any state-aided scheme of manuring to rejuvenate the coconut industry will have to keep this in mind. It is a common sight to see today second plantations allowed to fend for themselves, unmanured, unweeded and damaged by cattle '.

It has to be admitted that this applies to conditions even today. Except on the company estates, and the larger estates little manuring of underplanted young palms seem to be carried out on the small properties.

We would request those sceptical of the absolute necessity of manuring underplanted young palms to visit our manurial experiment on Letchemy Estate, Nattandiya and notice the spectacular difference between the unmanured and manured young palms even on a soil which could be considered comparatively fertile. The replanted blocks on this estate which are now carrying excellent crops that should convince anyone that an enlightened policy of manuring young palms always pays handsomely.

Another regrettable feature of underplanting is the delay in removing the old stand of palms. However well manured the young palms may be they will remain unproductive if shaded by the old palms as light is essential for the synthesis of plant food in the leaves.

With today's prices there are many proprietors who hesitate to cut down old palms which carry even a few nuts. Enlightened proprietors should, however take a long view and adopt a decisive policy of removing the old stand at least within three years from the time of flowering of the new plantation.

Manurial Experiment on underplanted young palms at Letchemy Estate, Nattandiya.

Manuring of Senile Palms

What response can be expected from the manuring of the old palms ? This is a question that is often put to us.

The question of manuring senile palms is a matter for an individual proprietor to decide when he could, from an economic point of view, either manure his old plantation and postpone the inevitable day when a second plantation should be established, or manure the old plantation and begin a second plantation more or less simultaneously.

It is difficult in a matter of this nature to draw a sharp line. The aim of a proprietor is to get a maximum return out of his land while the copra market is satisfactory, but this must be reconciled with a long range policy for the coconut industry as a whole, so that in due course any really senile palms will have been replaced by young plantations.

It should be stressed that the economic life of palms is largely extended by adequate manuring and cultivation. Many low yielding palms suffer from premature ageing and can be brought round and maintained in fair bearing by suitable treatment.

This has been well shown in our manurial experiment on underplanted young palms at Nattandiya, where as a result of annual manuring of the second plantation, with increasing doses not only did the seedlings benefit, but most of the old palms which looked beyond hope and carried hardly any nuts improved to such an extent that they carried a crop of 30 to 40 nuts per palm. Old palms if they did so well thriving on the plant food robbed out of the second plantations may have done equally well, if not better, had they been regularly manured.

We have to admit that more field experiments have to be carried out to determine the economics of manuring old palms. Replanting cannot produce any visible effects on crops for many years, whereas manuring of old plantations, depending on the economics of manuring such plantations under the changing prices of copra and manures, should increase production. In most estates senility of palms is not due to age, but lack of plant food due to prolonged neglect.

The Milk Board and the Manuring of Pastures

With the establishment of the Milk Board and its collecting centres, in the coconut areas, it will be expected that coconut estates will maintain milk cattle to supply a national need. It will therefore be inevitable that improved pastures will be established under coconuts and new manurial problems arising out of the optimum utilization of pastures and its interaction on the production of coconuts will have to be worked out. The manurial needs of pasture and of the coconut palm can be expected to be conflicting, the high nitrogen requirements of pastures being antagonistic to the nutrient requirements of the coconut palms.

With the prolific growth of a pasture grass such as *Bracharia brizantha* which would compete with the coconut palms these considerations are particularly relevant.

It is proposed to investigate these problems in a new manurial experiment that will be laid down at Ratmalagara Research Station.

In conclusion we have to admit that there are many gaps in our scientific knowledge on the manurial requirements of the coconut palm due to the varied soil and climatic conditions under which it is cultivated in Ceylon. The coconut palm is a difficult crop to experiment with. Carefully designed field experiments form the sheet anchor in arriving at valid conclusions. It is hoped that with the provision of adequate land we will be able to solve new problems some of which have been mentioned in the course of this paper.